AMENDMENTS TO THE SPECIFICATION

Page 4, Lines 2-24

The apparatus according to the invention enables preventative and corrective de-icing of lines in which the rated voltages are situated typically, but not restrictively, from 25 to 315 kV. For this reason, the apparatus can be called an ~~Energized Line De-icer~~ On-load Network De-Icer (hereafter referred to as ~~ELD~~ ONDI).

The ~~ELD~~ ONDI imposes an alternating current flow in the circuits of the lines looped between them for heating the conductors by the Joule effect. It can be embodied by classic and proven technologies such as phase shifting transformer (PST), capacitor, and circuit breaker. Its activation and exploitation can be achieved by ~~manoeuvring~~ maneuvering nothing but the circuit breakers (no disconnecting switch), which renders it unaffected by ice rain. We can therefore, by remote control, successively connect a plurality of lines of a target region to the ~~ELD~~ ONDI without any interruption of the charge, thus where it gets its name. The most strategic and critical lines can be heated before and during an ice storm in order to prevent the formation of ice.

The economic justification of the ~~ELD~~ ONDI at certain substations uniquely depends on its use as a de-icer. It is always important to emphasize that it is possible that in other regions, its ability to control power flow or other parameters of the grid can be profited from throughout the year.

The term ~~ELD~~ ONDI is used for referring to the function of the apparatus rather than the technology employed for realizing it. Depending on the lines to be de-iced, we see that the ~~ELD~~ ONDI can be constituted by a PST only or a PST in parallel with a capacitor. We can say that the PST is "assisted" when it is used in combination with a capacitor. An APST (Assisted Phase shifting Transformer) acts as a PST with regards to the transmission of active power.

Page 8, Lines

The ~~technology of interface power regulators (IPR)~~ interphase power controller (IPC) technology has given birth to three devices that have been commercialized by the company ABB: the decoupling ~~link (DL)~~ interconnector (DI), the ~~default~~ fault current limiting transformer

(~~DCLT~~ FCLT) and the assisted phase shifting transformer (APST). A PST has been in service at the Plattsburgh, New York substation since June 1998.

Page 9, Lines 1-2

In Figure 6, ~~a unitelegraphic schematic~~ the single-line diagram of the APST at the target substation, capable of serving as an ~~ELD~~ ONDI 20, is shown.

Page 10, Line 16 to Page 11, Line 2

A method of analysis of the power regulators (PST, APST, UPSC (Unified Power Flow Controller) or others) in the angle $\bar{o}$sr-power P plane has been developed. With this method, the interaction between a power regulator and the grid in which it is placed can be expressed quite easily. This method is used here to graphically illustrating the operation of the ~~ELD~~ ONDI. In the following lines, the main aspects of this method are outlined.

Page 11, Lines 26-27

Figures 10A-B respectively illustrate two methods by which the activation of a ~~ELD~~ ONDI can be achieved. Again, the example of a PST 2 is used.

Page 12, Lines 5-11

In a real situation, it may be necessary to ~~manoeuvre~~ maneuver many circuit breakers in order to obtain the effect of charging current concentration in a given line. It is worthy to note, in passing, that the concentration of de-icing current facilitates increasing the de-icing, but does not constitute an indispensable condition to the ~~ELD's~~ ONDI's operation. One is able to resort to the concentration of charging current in order to reduce the size of the ~~ELD~~ ONDI. The current of the ~~ELD~~ ONDI is therefore approximately equal to the de-icing current reduced from the contribution of the charging current.

Page 12, lines 25-30

Figures 11A-B show the differences between these two methods in the P-ōsr plane (Figure 11A for the first method, Figure 11B for the second method). The operational points 26 illustrated thereon correspond to the state of the grid and of the ~~ELD~~ ONDI in APST mode after its activation. While these schematics are qualitative, they represent quite closely a translation of the results obtained during the simulations of the activation of the ~~ELD~~ ONDI for line de-icing at 315 kV.

Page 13, Lines 1-8

Once the ~~ELD~~ ONDI is in service, there remains nothing but to vary the tap changer of the PST 2 to vary the imposed voltage and, in consequence, the internal angle Ψ. In the P-ōst plane, this variation of the internal angle is translated by the lateral sliding of the ~~ELD~~ ONDI characteristic 34 (in an APST mode for this example). Doing this, the intersection 26 of the ~~ELD~~ ONDI characteristic 34 and of the grid characteristic 36 will slide along the grid characteristic 36. It is by making the regulator characteristic 34 slide to the right that the operating conditions shown in Figures 11A-B become the conditions of Figures 12A-B under a de-icing condition.

Page 15, Lines 15-19

The ~~ELD~~ ONDI at the target substation can be principally composed of four parts: a phase shifting transformer; a capacitor bank; two circuit breakers; and two motorized section switches.

Lightning ~~rods~~ arresters should be used in order to protect the capacitors from the shocks coming from lightning and over-voltages, if required.

Page 16, Lines 5-29

The principal characteristics of the capacitor of the ~~ELD~~ ONDI are the following :a total of 465 Mvar (3 X 155 Mvar) at an ambient temperature of 0°C; rated voltage of 157 kV; reactance of 159 Ω; and a ground-phase rated insulation of the two terminals of the capacitors of 315/ 3kV.

As well as for transmission, the ~~ELD~~ ONDI can perform de-icing of three phase distribution lines.

Depending on the physical characteristics of the distribution lines to be de-iced, an ~~ELD~~ ONDI of type PST or APST can be used. The maximum length of the loops formed by the distribution lines depends on the characteristics of the lines. The PST used alone enables de-icing of relatively short loops, e.g. of 0 to 30 km approximately. Thanks to the voltage support provided by the capacitor of the APST, the latter can de-ice lines of approximately 0 to 60 km.

The currents and the voltage levels required for de-icing distribution lines are much lower than these required for transport lines in such a way that the rated power of an ~~ELD~~ ONDI for distribution lines is much weaker than that for transport lines. For this reason, it is possible to conceive of a mobile ~~ELD~~ ONDI installed on a platform. Such an apparatus can thus be conceived for de-icing many circuits of lines. In preparation for an ice storm, or ice rain, the apparatus is transported and then attached to the endangered lines. Transportability constitutes a very important asset for maximizing the economic value of the apparatus.

With reference to Figures 14A-C, different ways of connecting a mobile ~~ELD~~ ONDI to a distribution line outside a substation are presented. It can be seen on the unitelegraphic schematics of these Figures, a distribution substation 46, two distribution lines 48,50 and their charges 52. Also shown is an interruptor 54 enabling the lines 48,50 to be connected one to the other at the distribution grid level.

Page 17, Lines 14-19

With reference to Figure 15, another example of the use of an ~~ELD~~ ONDI, fixed or mobile, for de-icing distribution lines 48, 50 is presented. Here again, a PST type ~~ELD~~ ONDI is shown. This PST is attached directly to the set of buses 58 of the substation 46 in such a way as to have access to all the distribution lines connected to the substation. Using adequate manipulation of the circle breakers, interruptors 54 and section switches 60, the ~~ELD~~ ONDI is connected in series with the lines to be de-iced 48, 50.

Page 17, Line 24 to Page 18, Line 5

For example, a variant of the assembly illustrated on Figure 15 would be to replace at least one of the power transformers of the substation 46 by a transformer that would be, at the same tme, a step down and phase shifting transformer. As far as interruptors are available in the distribution grid for forming loops, this ~~ELD~~ ONDI wuld enable the flow of current for de-icing following an approach very similar to that shown in Figure 15.

Another variant of ~~ELD~~ ONDI could consist in simply installing a Y-Delta type series transformer for producing a fixed regular offset of 30 degrees. This very simple approach would permit the de-icing of lines as long as the impedance of these lines permitted a sufficient current for de-icing the conductors to be obtained without over heating the connectors, sections switches, cables or other apparatus in series in the de-icing loop. One could also foresee installing other types of transformers that offer an angular offset specially calculated for de-icing one or several lines in particular.